

Table S1: Sample locations for analysed water samples together with U concentration and isotope data. Uncertainty are 2σ . Three letter abbreviations are used for identification on Fig. 1. Rainfall and uplift data are derived from the digitized maps (Fig. 1) and represent the average values for the river catchment upstream from each sample location.

Location	Site		Latitude	Longitude	²³⁸ U	(²³⁴ U/ ²³⁸ U)		Rainfall	Uplift rate	
East Coast					p.p.t.			mm/yr	mm/yr	
Wairau	WAR	Road bridge	41 26 39.3	173 58 02.3	0.6	0.1	1.946	0.187	1129	1.8
Awatere	AWA	Road bridge	41 41	171 09	210.2	0.2	2.078	0.007	768	3.6
Clarence	CL1	Lake Tennyson	42 12 53.6	172 44 28.5	1.9	0.1	2.577	0.239	1280	2.3
Clarence	CL2	Down stream	42 19 32.7	172 46 14.4	1.1	0.3	2.774	0.108	1194	2.1
Clarence	CL3	Down stream	42 25 24.5	172 47 44.6	0.9	0.1	2.548	0.445	1136	2.1
Clarence	CL4	Acheron Accn. House	42 24 00.1	172 57 36.7	1.2	0.3	2.519	0.116	1114	2.2
Clarence	CL5	Seymour's Stream	42 10	173 50	11.1	0.2	2.289	0.015	953	3.2
Clarence	CL6	River mouth	42 09 51.3	173 54 42.7	92.3	0.5	2.861	0.037	938	3.7
Hapuku	HAP	Fault scarp	42 18 18.8	173 41 33.7	121.6	0.2	3.843	0.011	1270	6.5
Kowhai	KOW	Fault scarp	42 21 11.7	173 33 36.6	124.7	0.2	4.614	0.011	1173	7.2
Conway	CON	Fault scarp	42 27 00.3	173 16 27.1	179.5	0.2	2.277	0.008	948	4.6
Waimakariri	WM1	Arthur's Pass	42 56 36.2	171 33 54.9	34.5	0.1	2.589	0.009	6431	5.3
Waimakariri	WM2	Road bridge	43 21 27.9	172 03 09.0	30.2	0.1	1.735	0.010	2094	1.8
Rakaia	RAK	Rail bridge	43 45 09.2	172 01 49.8	30.7	0.5	1.411	0.025	3320	2.1
Pareora	PAR	Road bridge	44 29 54.9	171 12 05.3	18.7	0.2	1.329	0.022	648	0.1
Waitaki	WT1	Omarama	44 28 19.4	169 59 15.5	2.2	0.3	1.500	0.037	1317	0.6
Waitaki	WT2	Kurow	44 43 55.5	170 28 42.0	28.4	0.2	1.316	0.024	2378	1.5
Waitaki	WT3	Road bridge	44 55 38.5	171 06 04.4	9.0	0.2	1.297	0.043	2014	1.2
Clutha	CU	Beaumont	45 49 34.4	169 31 52.3	27.1	0.2	1.081	0.016	1556	1.1
West Coast										
Taramakau	TR1	Coast	42 37 58.1	171 11 59.7	34.2	0.2	1.092	0.016	5283	5.2
Taramakau	TR2	Inchbonnie	42 44 29.7	171 30 43.4	3.5	0.2	1.928	0.142	4064	6.6
Poerua	POE	Road bridge	43 09 39.6	170 30 17.2	18.5	0.2	1.232	0.015	6300	7.4
Whataroa	WHT	Road bridge	43 17 20.5	170 24 13.5	36.2	0.1	1.158	0.007	9277	7.4
Haast	HS1	Coast	43 56 11.5	169 07 43.7	30.9	0.2	1.185	0.026	10063	4.8
Haast	HS2	Landsborough	44 00 56.8	169 23 01.7	23.2	0.2	1.171	0.022	8925	4.3
Other										
Glacial Ice	MCK	Mount Cook	43 38 25.5	170 09 47.1	0.9	0.2	1.552	0.040		
Sea Water	SEA	Kaikoura	42 25	173 42	3233.9	4.8	1.148	0.001		
Ground Water	THR	Hanmer Spring	42 32	172 49	2.7	0.3	1.416	0.051		